

Implicit Higher Order Temporal Differencing for Aeroacoustic and CFD Applications, Phase I

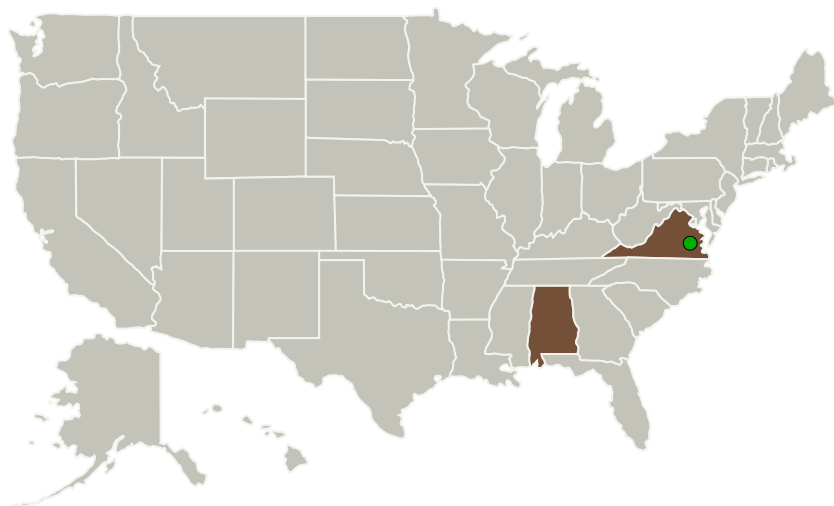
Completed Technology Project (2011 - 2011)



Project Introduction

This proposal presents a stand-alone implicit high order temporal differencing solver concept that will interface with research and commercial numerical analysis codes to provide unlimited temporal accuracy. While the computational fluid dynamics (CFD) market has mature products that solve a large portion of problems faced by practicing engineers, these tools are often inadequate for fast transient, multi-scale numerical problems such as highly resolved turbulence, vortex shedding and combustion instability where rapid, small scale local phenomena can be overwhelmed by numerical dissipation. Many research and commercial solvers perform sufficient spatial resolution, but use insufficient explicit or low order implicit temporal resolution. Higher order explicit temporal schemes are not always feasible when modeling turbulence, can be severely limited by the time step size, and are less efficient than even low-order implicit methods. In the proposed Phase I effort, a previously developed high order implicit time integration formulation, tested up to 11th order accuracy, will be extracted from an existing solver and interfaced with an independent finite-volume solver to prove the feasibility of providing decoupled time integration for existing numerical codes. In Phase II, the time integration formulation will be implemented in a software framework and tested with readily available, popular numerical codes

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
CFD Research Corporation	Lead Organization	Industry	Huntsville, Alabama
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138624>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CFD Research Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

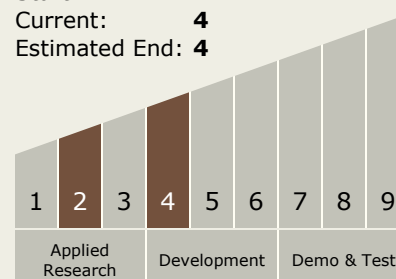
Carlos Torrez

Principal Investigator:

Paul J Dionne

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.7 Computational Fluid Dynamics (CFD) Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System